



Conference Notes
“The Future Ain’t What it Used to Be:
Planning for Climate Disruption”

Summary of Flooding, Stormwater, and Wastewater
Breakout Session

October 27, 2005
Qwest Field Conference Center
Seattle, Washington
Sponsored by King County

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Information on the conference is available at:
<http://metrokc.gov/climateconference2005>

Flooding, Stormwater, and Wastewater Session Steering Committee

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“The Future Ain’t What it Used to Be: Planning for Climate Disruption”
October 27, 2005
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Summary of Flooding, Stormwater, and Wastewater Breakout Session

On Thursday, October 27, 2005, King County hosted a one day meeting to engage a broad cross-section of Washington State governments, businesses, tribes, farmers, non-profits, and the community-at-large in a dialogue about climate change impacts and potential adaptations in Washington State. The following is a summary of the flooding, stormwater, and wastewater breakout group presentations and discussion. More information on the meeting, including electronic copies of the breakout group presentations, is available at <http://metrokc.gov/climateconference2005>.

The morning and afternoon flooding, stormwater, and wastewater breakout sessions were moderated by Allen de Steiguer of Carollo Engineers. A panel of three experts provided background on King County’s flooding, stormwater, and wastewater management systems with three morning presentations. Scientific data describing potential climate change impacts was presented in a similar, afternoon report. Panelist Dave Clark, formerly of the Department of Natural Resources (DNR), discussed flood hazard management in King County. Greg Bush, also of the DNR, discussed wastewater management in King County. Panelist Neil Thibert represented Seattle Public Utilities as he discussed Seattle’s stormwater management system. Finally, Phil Mote of the University of Washington Climate Impacts Group discussed the potential quantitative effects of future climate changes on municipal water management in the Pacific Northwest.

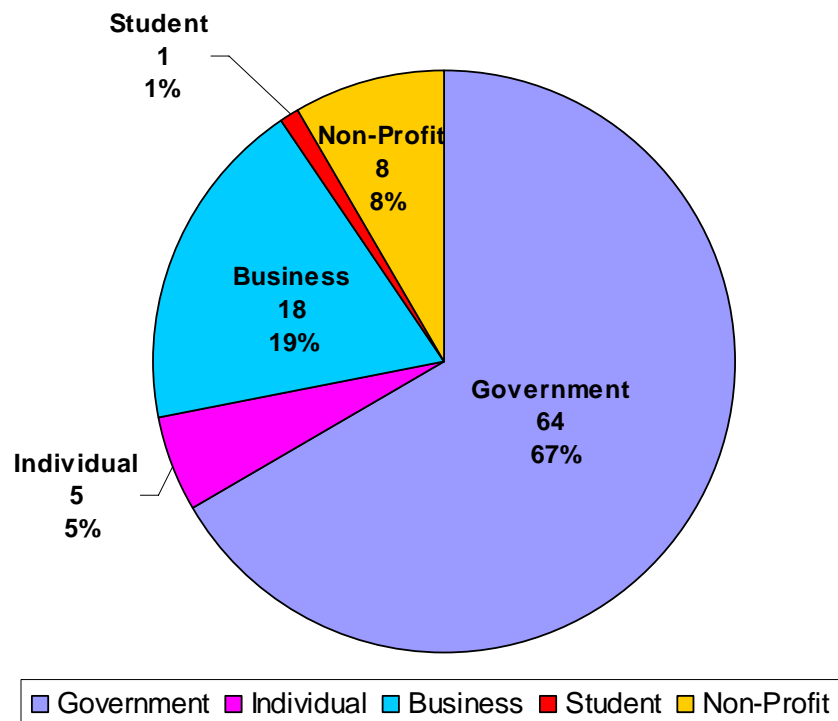
Following an extensive discussion, the flooding, stormwater, and wastewater breakout session participants identified the following three items as priorities in their afternoon report to the plenary:

- Public agencies must play a more significant role in addressing climate change issues both now and in the future. Agencies should incorporate more stringent design standards into public development projects and devote more resources to monitoring and enforcing standards established for private facilities.
- Better information is needed to accurately describe climate change. Though a complex issue, climate change must be quantified so that its impacts can be communicated in a specific, understandable, and tangible way to decision making entities and to the general public.
- New methods of decision making must be adopted in order to address the uncertainties associated with climate change and its potential impacts on municipal water management in the Pacific Northwest. One suggested change in methodology is that, to the extent possible, water resources agencies should begin to work more cooperatively to make decisions and develop mitigation strategies.

Participants

The flooding, stormwater, and wastewater breakout group attracted 96 participants. The majority of the group (66%) was from government agencies at the federal, state, county, and city levels, including utilities representatives. The next largest participant group was the business sector, with 18 representatives coming from private firms (19%). In addition, 8 individuals from non-profit organizations, and 5 unaffiliated participants attended. The individuals that were present have a wide variety of positions in their respective agencies, such that the group included engineers, scientists, management officials, and more.

**Impacts of Climate Change On Washington State
Flooding, Stormwater, and Wastewater Breakout Session
Participant Background
October 27, 2005**



Presentations

Dave Clark, King County DNRP (retired), "Flood Hazard Management in King County"

Dave Clark first depicted the three key elements of King County's Flood Hazard Management Program: policies and regulations, programs and services, and capital improvement projects. He then discussed how climate change might impact regulations and flood hazard mapping, flood protection facilities, and integrated planning and management strategies. The "Flood Hazard Management in King County" presentation can be found online at the conference website.

Question: How useful are current flood plain maps for future planning purposes?

Dave Clark: Current flood plain maps are of existing conditions, and are not predictive. A few exceptions exist, such as in Charlotte-Mecklenburg County, North Carolina. There, predictive maps have been developed and are effectively utilized by FEMA.

Question: How much money was invested in order for King County to earn a Class 3 rating (October 1, 2005) thru the NFIP Community Rating System?

Dave Clark: Over the years, the cost has exceeded millions of dollars. For instance, the Countywide River Improvement Plan costs over \$3 million each year. The monetary cost has exceeded the monetary benefit, but the program is one of few that give tangible dollars back to the people of King County.

Question: Has the insurance discount earned via the NFIP Community Rating System encouraged flood plain development, and thereby been counterproductive?

Dave Clark: Hopefully, this has not been the case. Strict regulations and codes in King County regarding flood plain development are sufficiently limiting such that the changes in cost have not had an impact on development rates.

Neil Thibert, Seattle Public Utilities, "Stormwater Management in King County"

Neil Thibert addressed stormwater management goals, tools, and means of long-term planning, analysis, and prediction. He then focused the remainder of his presentation on climate change induced concerns for stormwater managers. He raised potential issues such as high intensity storms, high tide levels, variations in impact on rural versus urban areas, facility and infrastructure design and capacity, and posed questions such as "How do we address uncertainties?" "How do we alter planning strategies?" "At what threshold should we change management strategies?" "How can we mitigate temperature changes in lakes and streams?" "How do we choose and gather necessary information?" and "What kind of staffing expertise will be needed?" The "Stormwater Management in King County" presentation can be found online at the conference website.

Question: Could prolonged high flows be as detrimental, if not more so, than major flood events?

Neil Thibert: Yes. One of the biggest concerns for channel maintenance is damage from erosion. Flood waters are, by definition, displaced from the channel and have little channel impact. On the other hand, consistent bankfull flow could have significant impacts via erosion of banks.

Greg Bush, King county DNRP, "Wastewater Management in King County"

Greg Bush briefly described the structure of King County's wastewater system. Unintended inflow and infiltration sources (I&I) in the separated sewer system and stormwater that is directed to the combined portion of the sewer contribute the majority of peak flow volume, and the potential effects of climate change on I&I were discussed in greater detail. Currently, historic rainfall, stream flow, and basin data are combined with historic population and economic growth information to project future wastewater flows. These flow forecasts are the design basis for 50 years and over a billion dollars worth of planned

infrastructure improvement projects (\$780-million to be spent on projects in the separated sewer system through 2050; and \$400-million spent on 20 projects in the combined sewer system by 2030). Whether or not to incorporate potential climate change impacts into these design plans, and how to go about doing so are challenging questions for the DNRP.

Question: In addition to the mentioned management methods, have you looked at ways to keep I&I water out of the system all together?

Greg Bush and Others: Yes. A variety of techniques to store, hold, slow, and otherwise keep runoff water out of the wastewater system are in place. Modeling shows that more stringent efforts to reduce I&I inflows may slightly reduce peak flows, but the water transfers to the stormwater system such that the impact is minimal.

Question: What is the expected quantitative increase in the intensity of rainfall?

Several: The annual averages will likely remain the same. However, there is some data to support a possible increase in event intensity. (No numbers were provided in response, though the question was set aside for discussion in the afternoon session.)

Question: Is the county making efforts to improve side sewer efficiency, such as providing incentives for homeowners to make repairs?

Greg Bush: No. The county only works on private property for demonstration purposes. Upgrades to side sewer infrastructure are preventatively expensive for the county. Homeowners are encouraged to address repair issues through their insurers.

Question: What would be some of the effects on homeowners of updating flood plain insurance maps?

Greg Bush: With larger, more accurate maps, it is likely that more extensive insurance policies will be required. While this may appear costly to homeowners, long-term benefits should exceed costs due to avoided damages.

General Discussion

The morning flooding, stormwater, and wastewater group discussion provided relevant background by describing the management techniques and infrastructures of the three systems of interest. The accuracy and effectiveness of current flood plain insurance maps was discussed in detail, along with the potential impacts that climate change may have on the maps. The negative impacts for channel maintenance and water quality due to increased stormwater flows related to climate change were also addressed. Finally, the merit of spending money now to avoid future, long-term costs was contrasted with the severe consequences of devoting limited funds to large-scale, preventative projects, and thereby implementing fewer mitigation projects over a smaller area.

Panel Discussion

Moderator: Allen de Steiguer, Carollo Engineers

Panelists: Dave Clark, King County Water and Land Resources Flood Hazard Reduction Services Manager (retired), King County DNRP

Neil Thibert, Drainage and Wastewater Capital Improvement Program Fund
Manager, Seattle Public Utilities
Greg Bush, Treatment Planning and Compliance Manager, Wastewater
Treatment Division, King County DNRP
Phil Mote, CIG Principal and Assistant Professor, University of Washington
Climate Impacts Group

Purpose and Structure of the Panel Discussion

The purpose of the panel discussion was to engage attendees in discourse regarding how to deal with the impacts of climate change on flooding, stormwater, and wastewater management systems. The panel discussion was scheduled for 1:45-3:00, though it started approximately 15 minutes late. Discussion began when the panelists were asked to list what additional information and research would be necessary to begin to appropriately address climate change. Responses by the panelists sparked discourse among the other attendees, who largely enumerated what they felt were key issues. The moderator then posed the question of how different individuals and their respective agencies might best make investment decisions in light of the uncertainties surrounding climate change, which led to additional questions and issues being raised.

Discussion Summary

Neil Thibert, Seattle Public Utilities:

With respect to climate change, the two most significant factors of concern in managing Seattle's well-developed, urbanized, stormwater system are rainfall and temperature. Rainfall events of greater intensity may have significant impacts on erosion and habitat destruction in urban channels. Temperature change may be equally destructive to habitat and biota. In general, changes in both temperature and rainfall patterns may be detrimental to water quality and channel structure and lead to an increase in the number of problems in urban streams. In addition, increased winter flooding would likely increase runoff, habitat destruction, the need for additional control structures, and maintenance costs in suburban and rural areas as well.

Greg Bush, King County DNRP:

How are agencies currently making decisions, plans, and designs for future facilities and for the upsizing of current facilities? Are they applying a margin of safety to future plans? Are climate change concerns being incorporated?

Dave Clark, King County DNRP (retired):

Emphasis should be placed on water resources management from a broad perspective, as opposed to compartmentally (e.g. floods, fish, recreation, water quality, etc.). Water management agencies should network, share data, and work cooperatively to the extent possible so as to better spend scarce public funding to address water resources issues held in common. Instead of developing independent solutions that may be as likely to harm as they are to help other agencies address a common problem, benefits can be maximized by developing a solution agreeable to all agencies.

Audience comment:

While King County has managed for and mitigated flood hazards, there has not been comparable management for channel migration issues. Climate change may result in an increased percentage of yearly flows at or near bankfull levels, thereby directing more energy at channel banks. Meanwhile, increased floodplain development is, and will continue to necessitate implementation of bank hardening and mitigation measures. The combination of these two factors along with the lack of proven historical management techniques suggests that channel migration may be a significant issue in the future

Audience question:

In order to address climate change issues, public funds must be invested in mitigation projects. Investment in these projects requires justification by explanation of expected benefits. Currently, how are public agencies addressing decision makers and justifying investment needs when the benefits may not be realized for 40 or 50 years, if at all?

Response comment:

Some local communities have made very effective long-term decisions. For example, Lake Haven has developed a 75-year water plan to incorporate reclaimed water based on future trends. In order to make these decisions, agencies must look at alternative possibilities and the range of uncertainties, consequences (especially at extremes), and economic benefits associated with each. If the project proves to be a cost effective improvement over the lifetime of the facility, it can be justified in the budget.

Response comment:

Five years ago, Seattle announced that its water supply would be sufficient only through 2040. Since that time, several agencies, utilities, and interest groups have initiated forward-looking plans and studies in order to develop alternative sources of supply, despite the fact that the benefits of these efforts will not be realized for some time.

Moderator question:

How are agencies currently making investment decisions? Do analyses model the current climate as a fixed component? If so, should that be changed?

Response (Employee of Marysville Utilities):

Currently, an effective means of incorporating climate change into decision making is not known. In order to suggest capital investments to elected officials, solid supporting data is required. While potential trends resulting from climate change can be predicted, the detailed impacts are not yet known. Because financing projects often require long-term bonding, obtaining reliable, long-term, predictive data (20 years worth or more) will be key in how the issues of climate change are incorporated and addressed by decision makers.

Response (Employee of King County Stormwater Services)

Facilities designs in King County are based on 50 years of historic rainfall. As such, it is unknown whether or not the design events which facilities were designed to handle have occurred. Because of these uncertainties, designs incorporate strict safety factors and conservative assumptions. However, it is not known if climate change is being accounted for as well, or if designs should be even more conservative.

Audience question (addressed to Dave Clark):

To what level of incident should agencies design for, and to what extent should development in floodways be prohibited considering benefits and costs.

Dave Clark:

There is no solid answer, but for various reasons, it is the case that FEMA's flood plain management maps are sometimes out of date in a very short period of time. The two key considerations for this question are the technical and political aspects of the issue. On the one hand, agencies must consider what can be reliably and accurately modeled. On the other hand, they must also be conscientious of what is politically viable and can be implemented in actuality. It should also be noted that the consequence of bigger projects built to more stringent standards mean that fewer will be built.

Audience comment (Employee of King County Department of Development and Environmental Services):

The private sector has been held to strict standards that regulate onsite stormwater and wastewater management. While it was easy for the public sector to require the development community to bare the front end of control costs, the limit of effective mitigation measures may have been reached. As such, it is time for public agencies to hold themselves responsible for meeting similar standards of mitigation. Emphasis should be placed on incorporating strict design standards into new public development projects.

Response comment:

While regulatory measures have mandated the inclusion of stormwater and wastewater facilities for the private sector, very little inspection of these facilities takes place. In old and/or large jurisdictions, the resources necessary for regular and thorough inspections of these facilities are lacking. The millions of dollars worth of facilities developed annually are, to some degree, wasted because there is no incentive for them to be properly operated or maintained.

Moderator question:

How would a climate change induced change in the hydrograph affect water management facilities?

Audience response:

Alternative mitigation measures such as green building and low-impact development can help mitigate stormwater runoff and should be considered in addition to infrastructure development.

Audience comment:

The current water resources management approach does not adequately mimic the natural hydrologic cycle and is not only inappropriate now, but seems ill-equipped to deal with the impacts of climate change.

Response:

Low-impact development and best management practices are increasingly being implemented by stormwater managers in order to get more water back into the ground and retain more water onsite, thereby more closely mimicking the natural cycling processes of the water system.

Audience comment (Private consultant):

The largest current challenge in working with communities regarding climate change is how to quantify the issue. Even simple standards based on trends (e.g. a 10% rule) and supported by a consensus group, educational body, or regulatory agency would prove useful in addressing the public and city council groups.

Audience comment:

There are three climate change related actions that can and should be moved forward on at this point: 1) Future flood plain maps should be developed. Enough information has been gathered regarding large river hydrograph changes associated with snowpack and snowmelt associated with climate change that predictive mapping techniques should be implemented. 2) Problems associated with discharge into salt water should be addressed. It is known that sea level rise and changing tide elevations are likely to cause hydrologic issues that will adversely affect drainage. This issue can be addressed. 3) Channel migration is a significant issue now and will continue to be so in the future. While flood insurance maps are binding, future condition maps can and should be developed for regulatory purposes that bind developers not to purchasing flood insurance, but to mitigation efforts.

Audience comment (Industrial Insurance Representative):

In the industrial business sector, preparing for climate change is likely to require designing for extremely significant events. The 500-year event may take on the role formerly occupied by the 100-year event for industrial insurance planning.

Audience comment:

Agencies should think of the floodplain as an area that helps link other areas, or a “corridor,” and not just simply associate the term with risk definitions.

Audience comment:

Given the general lack of certainty in climate change issues, investing scarce resources in mitigating its impacts may not be an effective allocation of funds. Until potential negative impacts are adequately quantified, funds should be utilized to address the many more tangible problems and needs that currently exist in King County’s water systems.

Audience comment:

The issue of temperature was underemphasized during the conference, despite this factor’s ease of measurement. Climate change may necessitate that stormwater facilities implement temperature controls for fish in the future.

Audience comment:

What constitutes “dangerous?” What constitutes “risk?” Public agencies should redefine these concepts and develop more specific ideas of what threshold they are managing for.

Audience comment:

One means of addressing future uncertainties is to build resilience into water resources management systems.

Summary of Afternoon Session

The afternoon allowed the flooding, stormwater, and wastewater breakout session participants to voice their most significant concerns with respect to climate change. Issues of significance for the panelists included changes in factors such as temperature and rainfall that may adversely affect water quality and erosion potential, the difficulty of incorporating climate change uncertainties into the process of decision making, and the growing need for

public agencies to work cooperatively together in order to effectively manage water resources with limited funds.

In general, the group felt a need to gather a larger body of information of high quality that will allow for the accurate prediction of climate change impacts. Climate change must be quantified, if only generally or in trends in order to successfully impact regulatory and investment decisions. In the future, public agencies have a larger role to play in both implementing higher standards for public development projects and in managing private facilities via improved inspection procedures. However, it was also noted that while incorporating climate change might entail making early investments and designing for more significant events (i.e. the 500-year flood event as opposed to 100-year flood event), the copious funds required to implement such designs would necessitate that fewer projects be undertaken. Because of limited funding, the result of this is that some areas would not receive the benefit of mitigation projects at all. A closing comment emphasized the need to apply scarce resources to more tangible problems until any negative impacts of climate change can be better quantified and extensive mitigation projects can be justified.

Summary of Report to Plenary

Following the afternoon breakout group discussion, all conference attendees reconvened to report each group's top three priorities for addressing climate change. The flooding, stormwater, and wastewater group moderator, Allen de Steiguer, summarized the breakout group's discussion and emphasized the following top three priorities:

- Public agencies must play a more significant role in addressing climate change issues both now and in the future. Agencies should incorporate more stringent design standards into public development projects and devote more resources to monitoring and enforcing standards established for private facilities.
- Better information is needed to accurately describe climate change. Though a complex issue, climate change must be quantified so that its impacts can be communicated in a specific, understandable, and tangible way to decision making entities and to the general public.
- New methods of decision making must be adopted in order to address the uncertainties associated with climate change and its potential impacts on municipal water management in the Pacific Northwest. One suggested change in methodology is that, to the extent possible, water resources agencies should begin to work more cooperatively to make decisions and develop mitigation strategies.